constants. Nott theorem proves that conservation law is equivalent to symmetry, suggesting that the ultimate law may be rooted in geometric symmetry. 3. Verification Dilemma and Future Direction The bottleneck superstring theory of experimental technology requires 10-15 times as much energy as the existing accelerator, so it cannot be verified in a short time. Cosmological observations (such as dark matter and dark energy) may provide indirect evidence, but it is necessary to break through the existing detection methods. Calculating the possibility of simulation Quantum computers can simulate high-energy physical processes and verify theoretical models (such as quantum chromodynamics) through algorithms. The hypothesis of virtual universe (such as the metaphor of "Earth Online") leads to the conjecture of the codification of natural laws, but there is no empirical path. Fourth, the possible characteristics of the ultimate law (speculative) unity: compatible with relativity and quantum mechanics, explaining dark matter/energy. Mathematical minimalism: such as the geometric expression of Einstein's field equation ($G_{\mu\nu}=8\pi T_{\mu\nu}$). Observability: There is at least one prediction that can be verified by the next generation of experiments (such as supersymmetric particles). Philosophical self-consistency: responding to meta-questions such as "the origin of all things" and "the law of motion" The exploration of the ultimate law is not only a scientific problem, but also a philosophical challenge to human cognitive boundaries. At present, the more realistic path may be "phased unification", for example, explaining the information paradox of black holes through quantum gravity theory, rather than the universal equation overnight. As Hawking said: "Even if there is an ultimate theory, human beings may not fully understand its meaning." The development of natural science profoundly reveals the dynamic and dialectical nature of human cognition of the objective world. Regarding the relativity and absoluteness of scientific theory, we can analyze it from the following aspects: 1. The phased truth attribute of scientific cognition 1. Relativity of theoretical application scope: the effectiveness of Newtonian mechanics in the macro-low-speed field is in sharp contrast to the applicability of quantum mechanics in the micro-scale and relativity in the high-speed strong gravitational field. Each theory constitutes an "absolute truth" at a specific scale, but this absoluteness is always limited by its application boundary. 2. Breakthrough in the limitation of mathematical tools: After Maxwell's equations unified electromagnetic

phenomena, the seemingly perfect mathematical form failed to explain the photoelectric effect, which gave birth to quantum theory. This proves that the "ultimate" of any mathematical model implies undiscovered physical dimensions. Second, the dialectical development model of scientific revolution 1. The inevitability of paradigm shift: Kuhn's theory of scientific revolution shows that when abnormal phenomena accumulate to a critical point, the old paradigm will inevitably be replaced by the new paradigm. This replacement is not a simple negation, but a sublation process that contains the rationality of the old theory. 2. Inheritance of correspondence principle: Relativity degenerates into Newtonian mechanics at low speed, and quantum mechanics returns to classical statistics at macro scale. This degeneration ensures the continuity of scientific knowledge and proves the inclusive development between the old and new theories. Third, the hierarchical existence of natural laws 1. Deep stability of conservation laws: basic laws such as conservation of energy and conservation of angular momentum are always established in known physical processes, but their manifestations change with the theoretical framework (such as the unity of mass and energy in relativity). 2. Evolutionary characteristics of symmetry breaking: The symmetry breaking mechanism in the standard model indicates that the unity of the basic force of the universe may exist in a higher energy scale, suggesting that the existing theory is only a low-energy approximation of the more basic theory. 4. Cognitive boundary of scientific realism 1. Model-dependent realism: Quantum entanglement challenges the classical realism, which shows that our understanding of "reality" is always restricted by observation means. Theoretical model is both a cognitive tool and a cognitive boundary. 2. Enlightenment of mathematical reality: gauge field theory corresponds to differential geometry in depth, and superstring theory is self-consistent with mathematics in high-dimensional space, suggesting that there may be an ultimate structure beyond the current physical intuition, but human cognition may stop at a certain level forever. V. Ultimate Paradox of Scientific Exploration 1. Metaphor of Godel's Incompleteness Theorem: Undeterminable proposition in formal system implies that natural science may never establish a completely self-consistent ultimate theoretical system. 2. The practical dilemma of observer's participation: the measurement problem in quantum mechanics exposes the inseparability of cognitive subject and object, which makes the

concept of "purely objective" natural law face fundamental challenges. The development of contemporary philosophy of science shows that the essence of natural science is a dynamic process of constantly constructing cognitive models. The pursuit of the so-called "ultimate theory" is essentially the eternal yearning of human reason for the unity of the universe. This yearning promotes scientific progress, but it also warns us that keeping cognitive openness and being wary of any form of absolute dogma is the core essence of scientific spirit. In the tension between relativity and absoluteness, science not only gains the impetus, but also maintains the necessary humility-this may be the most intelligent gesture of human cognition in the process of infinitely approaching the truth. Different disciplines and philosophical perspectives have given multi-dimensional answers, negation of negation and philosophical propositions about whether there is ultimate law in natural science. The following is a comprehensive analysis from three aspects: philosophy of science, subject cases and technical verification: First, the dynamic development of scientific theory. The temporary and cumulative nature of scientific theory is always in the process of dynamic revision, such as Boyle's law from "absolute truth" to the discovery that it is only applicable to low temperature and low pressure conditions. Kuhn's paradigm revolution theory points out that scientific progress is not nonlinear accumulation, but qualitative change is achieved through the change of old and new paradigms, such as the transcendence of relativity over Newtonian mechanics. The fact that the four basic forces of modern physics have not been unified also confirms this point. Breakthrough of technical verification on theoretical boundary The breakthrough of drilling technology of bedrock under Antarctic ice reveals the limitation of geological model that needs physical verification. Similarly, the observation of micro-world by quantum mechanics constantly subverts classical physical cognition. The scope of human cognition of the universe has expanded from the solar system to the field of dark matter, and every observation technology innovation brings about the reconstruction of the theoretical framework. Second, the concrete manifestation of the relativity and absoluteness of truth dialectical relativity in the discipline Physics: Einstein's field equation is effective in the macro universe, but it can't explain the quantum scale phenomenon. Life science: the law of DNA base pairing (A-T, G-C) reflects the complementarity of Yin and Yang, but there are still a lot of unsolved

mysteries about the gene expression mechanism. Brain science: Computer can simulate logical reasoning, but it cannot reproduce the neural mechanism of human emotional decision-making. The absolute historical characteristics of Newtonian mechanics still have practical validity in the low-speed macro field, and the successful prediction of gravitational waves by general relativity verifies the local truth of its view of time and space. This kind of "finite absoluteness" forms the basis of technical application. For example, GPS system must consider both special relativity and general relativity correction. Third, the cognitive differences in the perspective of civilization The differences in the philosophical roots between the East and the West tend to lead to the pursuit of "ultimate truth" (for example, string theory tries to construct The Theory of Everything). This difference is reflected in contemporary scientific exploration: there are both attempts to construct universal equations of the universe and the path of "agnosticism" to accept cognitive limitations. The Cognitive Breakthrough Direction in Frontier Field Quantum Gravity Theory: Reconciling the Space Curvature/Quantum Fluctuation Contradiction between General Relativity and Quantum Mechanics Study on the Origin of Life: Paradigm Transformation from Chemical Evolution Theory to Self-organizing System Theory Dark matter Detection: The existing material theory can only explain 5% of the composition of the universe. Fourth, methodology enlightens iterative cognitive tools. It is equally important to establish an absolute space-time coordinate system (such as dating Antarctic ice cores) and develop new observation instruments (such as james webb telescope). Interdisciplinary integration trend The intersection of artificial intelligence and brain science produces brain like computing, and the theory of Oriental Yin and Yang inspires modern quantum theory research, showing the value of methodological integration. With regard to the dynamic revision of scientific theories, the following are illustrated by typical cases in many disciplines, showing how scientific theories are constantly iterated and perfected in practice: 1. The revision of Newtonian mechanics by general relativity in the field of physics is absolutely effective in the low-speed macro field, but it cannot explain the strong gravitational field and high-speed motion phenomenon. Einstein introduced the space-time bending theory and put forward the general theory of relativity, which successfully predicted the precession phenomenon of Mercury perihelion (the deviation of 43 angular

seconds every hundred years) and corrected the error of the classical mechanical model. The error correction of GPS satellite positioning system (special relativity time expansion and general relativity gravitational field effect should be considered at the same time) proves the engineering value of this correction. Quantum mechanics breaks through the paradigm of classical physics. Bohm's quantum potential theory transforms Schrodinger equation into the form of classical equation+Planck constant correction term, trying to reconcile the contradiction between quantum phenomenon and classical physics. Although this theory has not been fully accepted by the mainstream, it has inspired the subsequent development of quantum field theory. Similarly, the attempt to modify the standard model by string theory also reflects the multi-path exploration of physical theory. 2. Dynamic adjustment of frozen soil engineering model in the field of earth science During the construction of Qinghai-Tibet railway, scientists found that traditional frozen soil theory could not explain subgrade deformation in high temperature frozen soil area. Scientists put forward the theory of "active cooling subgrade", which forms a natural "thermal semiconductor" through air convection in the gravel layer, dynamically modifies the original passive thermal insulation model, and solves the problem of track hot melt settlement. This case shows the synergy between theoretical revision and technological innovation. By dynamically modifying the inversion parameters, the accurate prediction of the rock structure of the main hole of continental scientific drilling is realized, and the limitations of the early linear inversion method are corrected. Iii. Prediction model of submarine target impact burial in the field of engineering technology Aiming at the error of static parameter model in the process of dynamic impact, scientists put forward a dynamic correction method of cohesion modulus and friction angle modulus. The trust region gradient algorithm is used to adjust the model parameters in real time, which improves the prediction accuracy of buried depth of small targets on the seabed by more than 40%. Application of Rough Set Theory in Fault Diagnosis Traditional fault diagnosis rules are easy to fail when the samples increase. Based on the dynamic rule correction method of rough set theory, the accuracy of fault diagnosis of rolling bearing is improved from 72% to 89% through attribute reduction and incremental update of rules, which shows the self-correction ability of data-driven model. Fourth, methodological

enlightenment: These cases jointly reflect the typical path of scientific theory revision: technical verification drive: observation/experimental technical progress forces theoretical revision (such as quantum mechanics subverting classical physical cognition). The boundary conditions are clear: Newtonian mechanics is still effective under limited conditions, and the revision occurs when the theoretical application scope expands. The iterative verification mechanisms such as chaotic theory correcting earthquake model, Yin-Yang theory inspiring quantum research, etc.: frozen soil model passed the 14-kilometer test section verification, seabed model relied on gradient algorithm to dynamically adjust parameters, and scientific theory was dynamic. Just as Einstein's field equation is effective at the macro level but fails at the quantum scale, this "finite absoluteness" is promoting a new round of theoretical innovation, which confirms the endless nature of scientific exploration. Whether there is absolute truth or ultimate theory in natural science needs to be comprehensively analyzed from three aspects: philosophy of science, discipline practice and cognitive boundary. 1. Correctability and relativity of scientific theory. falsifiability and dynamic development Popper put forward that the symbol of scientific theory lies in falsifiability, not absolute correctness. For example, Newtonian mechanics is effective in the macro field of low speed, but it is modified by general relativity; Quantum mechanics also reveals the non-classical characteristics of the micro-world, indicating that the essence of scientific theory is the phased achievement of "limited application" Technical verification and boundary breakthrough Einstein's general theory of relativity successfully predicted gravitational waves, but its failure at the quantum scale shows that any theory has its scope of application. Similarly, the dark matter model (which only explains 5% of the matter in the universe) and the incompleteness of quantum gravity theory both reflect the limitations of human cognition. Second, the controversy and finiteness of absolute truth. Some scholars believe that some natural laws (such as causality and one-way time) are absolute. For example, the mathematical axiom of 1+1=2 or the attribute of three-dimensional space is often regarded as an unshakable truth. However, this "absoluteness" still depends on the self-consistency of human logic system, and mathematics itself may change due to the adjustment of axiomatic system. The "absoluteness" fragment in the relative truth, such as the effectiveness of Newtonian mechanics at macro low speed and

the law of DNA base pairing, has been revised or supplemented, but it still has practical significance in a specific range. This kind of absoluteness essence is the phased agreement between cognitive tools and objective reality, not the eternal truth. Third, the rationality and dilemma of the ultimate theory exploration. The scientific value of the great unity theory. Pursuing the unity of basic forces (such as string theory and supersymmetry theory) is an effort to simplify complexity scientifically. Although it has not been successful, such attempts have promoted the development of mathematical tools (such as topology) and experimental technologies (such as particle collider). The cognitive paradox of the ultimate theory is a logical contradiction: if a theory is declared as the "ultimate truth", it is necessary to assume that human cognition has completely exhausted the laws of the universe, which is contrary to the experience of the history of science. Practical dilemma: The Big Bang theory and black hole model rely on indirect evidence, which cannot be verified by direct experiments, and their "ultimate" is in doubt. Fourth, methodological enlightenment: the combination of open cognition and criticism may balance the radicalism and conservatism of scientific exploration. Shi Yigong, a scientist's rational attitude, pointed out that the essence of science is "continuous improvement of knowledge". For example, actively accepting negative experimental results and avoiding the trap of perfectionism reflect the consciousness of theoretical error. This attitude promotes the progress of science in the "hypothesis-verification-correction" cycle. Conclusion The concept of "absolute truth" in natural science needs to be carefully defined: local validity: the law established under certain conditions (such as the theory of relativity in the macro universe) can be regarded as phased absoluteness. Ultimate illusion: claiming to find eternal equations (such as the grand unified theory) is easy to fall into the fallacy of scientism because it ignores the historical and technical dependence of cognition. The value of science lies not in the pursuit of unattainable absolute truth, but in infinitely approaching a deeper explanation of nature through theoretical iteration that can be falsified. As Popper said, "Scientific knowledge is a hypothesis that has not been falsified". On the grand unified theory of physics (Gut) and The Theory of Everything (T.

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